

### AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

#### LISTING OF CLAIMS

- 1-15. (Canceled)
16. (Withdrawn) A method for increasing the signal-to-noise ratio in the characteristic optical response of an array having subpopulations of sensor elements comprising:
- a) providing an array comprising:
    - i) at least a first subpopulation comprising first sensor elements; and
    - ii) a second subpopulation comprising second sensor elements;
  - b) contacting said array with a composition comprising at least a first target analyte;
  - c) obtaining a first measurement from at least two of said sensor elements of at least one of said subpopulations;
  - d) summing said first measurements from said sensor elements; and
  - e) performing a statistical analysis on said first measurements.
17. (Withdrawn) The method according to claim 16 further comprising obtaining at least a first control measurement and adjusting the baseline of said first measurement against said first control measurement.
18. (Withdrawn) The method according to claim 16 wherein the signal-to-noise ratio is increased by a factor of at least 10.
19. (Withdrawn) The method of claim 16 wherein an analyte detection limit is reduced by a factor of at least 100.
20. (Previously presented) The method of claim 27, wherein said sensor elements are beads and said array comprises subpopulations of beads dispersed on a substrate.
21. (Original) The method of claim 20 wherein said substrate is a fiber optic bundle.
22. (Original) The method of claim 20 further comprising identifying the location of each sensor element within each sensor subpopulation within the array.
23. (Withdrawn) The method according to claim 16 wherein said sensor elements comprise chemical functional groups.

24. (Withdrawn) The method according to claim 16 wherein said sensor elements comprise oligonucleotides.

25. (Withdrawn) A method for amplifying the characteristic optical response of an array having subpopulations of sensor elements comprising:

- a) providing an array comprising:
  - i) at least a first subpopulation comprising first sensor elements; and
  - ii) a second subpopulation comprising second sensor elements;
- b) contacting said array with a composition comprising at least a first target analyte;
- c) obtaining a first measurement from at least two of said sensor elements of at least one of said subpopulations; and
- d) summing the optical response.

26. (Withdrawn) A method according to claim 25 further comprising obtaining at least a first control measurement and adjusting the baseline of said first measurement using said first control measurement.

27. (Currently amended) A method of statistically analyzing response signals obtained from a sensor element array to determine the statistical validity of said response signals, said method comprising:

- a) providing an array with a plurality of subpopulations of sensor elements, the plurality of subpopulations of sensor elements comprising a first subpopulation comprising sensor elements having the same first bioactive agent and a second subpopulation comprising sensor elements having the same second bioactive agent;
- b) contacting said array with a composition comprising at least a first target analyte, thereby producing a response signal at said sensor elements of at least one of said first and second subpopulations;
- c) obtaining individual response signals at each of said sensor elements from at least one of said first and second subpopulations; and
- d) performing a statistical analysis on said response signals from at least one of said first and second subpopulations, whereby statistical validity of said response signals is determined.

28. (Canceled)

29. (Previously presented) The method according to claim 27, wherein at least one of said bioactive agents is a nucleic acid.

30. (Previously presented) The method according to claim 27, wherein at least one of said bioactive agents is a protein.

31. (Previously presented) The method according to claim 20, further comprising determining outlying beads and excluding outlying beads from said subpopulation.

32. (Previously presented) The method according to claim 27, wherein said statistical analysis comprises calculating the mean of at least said response signals from said first of said plurality of subpopulations.

33. (Previously presented) The method according to claim 27, wherein said statistical analysis comprises calculating the standard deviation of at least said response signals from said first of said plurality of subpopulations.

34. (Previously presented) The method according to claim 27, further comprising evaluating the statistical validity of said response signals.

35. (Previously presented) The method according to claim 27, further comprising performing a second statistical analysis on said response signals.

36. (Previously presented) The method according to claim 35 wherein said second statistical analysis comprises evaluating said measurements using confidence intervals.

37. (Previously presented) The method according claim 35, wherein said second statistical analysis comprises using said response signals to perform hypothesis testing.

38. (Previously presented) The method according to claim 27, further comprising comparing said statistical analysis of response signals obtained from at least two subpopulations.

39. (Previously presented) The method according to claim 38, wherein said statistical analysis comprises performing a cluster analysis of response signals from each of said subpopulations.

40. (Withdrawn) A method comprising:

- a) providing an array comprising beads on a substrate comprising a plurality of subpopulations of sensor elements, wherein each sensor element comprises a bioactive

agent that will bind a target analyte, and at least two of said subpopulations comprise different bioactive agents that will bind the same target analyte;

b) contacting said array with a composition comprising at least a first target analyte;

c) obtaining a measurement from the optical response of each sensor element; and

d) performing a statistical analysis on said measurements from each sensor element.

41. (Withdrawn) The method according to claim 40, wherein at least two of said subpopulations each comprise bioactive agents that will bind different target analytes.

42. (Withdrawn) The method according to claim 41, wherein at least one of said bioactive agents is a nucleic acid.

43. (Withdrawn) The method according to claim 41, wherein at least one of said bioactive agents is a protein.

44. (Withdrawn) The method according to claim 40, further comprising, determining outlying beads and excluding outlying beads from said subpopulation.

45. (Withdrawn) The method according to claim 25, further comprising:

c) performing a statistical analysis on said measurements of at least one of said subpopulations.

46. (Previously presented) The method according to claim 27, wherein said substrate is selected from the group consisting of glass and plastic.

47. (Previously presented) The method according to claim 20, wherein said substrate is selected from the group consisting of glass and plastic.

48. (Withdrawn) The method according to claim 17 wherein said adjusting comprises subtracting said first control measurement from said first measurement.